WISSENSCHAFTSZENTRUM BERLIN
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Joseph A. Clougherty *
Anming Zhang **

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* WZB - Wissenschaftszentrum Berlin
** University of British Columbia

SP II 2004 – 10

June 2004

ISSN Nr. 0722 – 6748

Research Area
Markets and Political Economy

Forschungsschwerpunkt
Markt und politische Ökonomie

Research Unit
Competitiveness and Industrial Change

Abteilung
Wettbewerbsfähigkeit und industrieller Wandel

Zitierweise/Citation:

Joseph A. Clougherty and Anming Zhang, **Export Orientation and Domestic Merger Policy: Theory and Some Empirical Evidence**, Discussion Paper SP II 2004 – 10, Wissenschaftszentrum Berlin, 2004.

Wissenschaftszentrum Berlin für Sozialforschung gGmbH,
Reichpietschufer 50, 10785 Berlin, Germany, Tel. (030) 2 54 91 – 0
Internet: www.wz-berlin.de

ABSTRACT

Export Orientation and Domestic Merger Policy: Theory and Some Empirical Evidence*

by Joseph A. Clougherty and Anming Zhang

The recent 'open-economy industrial organization' literature generally finds export-orientation to enhance the weight of post-merger international competitive gains; thereby, favoring lenient domestic merger policy. We observe, however, that mergers seldom generate the 'significant synergies' that are supportive of international competitive gains. Further, we explore a joint-economies of production effect which suggests that domestic mergers tend to generate international competitive losses (not gains). Accordingly, we contend that export-orientation favors strict (not lenient) domestic merger policy. In order to support this contention, we develop a model illustrative of how non-synergistic domestic mergers in the presence of international sales might reduce national welfare and incur stringent merger-reviews. Further, using a panel data set composed of U.S. merger policy by manufacturing sector over the 1990-2001 period, we empirically support export-orientation leading to strict merger policy.

Keywords: open-economy, merger-policy, export-orientation, antitrust

JEL Classification: L40, F10

* We would like to thank Jim Brander, Johan Lagerloef, John Panzar, Tom Ross, and two anonymous referees for helpful comments and discussions on an early version of the paper. Financial support from the Social Science and Humanities Research Council of Canada (SSHRC No. 410-2003-1613) is gratefully acknowledged.

ZUSAMMENFASSUNG

Exportorientierung und nationale Fusionspolitik: Theorie und empirische Belege

In der neueren Literatur zur Industrieökonomie in offenen Volkswirtschaften wird allgemein herausgestellt, dass die Zunahme internationaler Wettbewerbsvorteile durch eine Fusion umso stärker ins Gewicht fällt, je höher die Exportorientierung der Volkswirtschaft ist. Mithin wird eine nachsichtige nationale Fusionskontrolle befürwortet. Im Gegensatz dazu stellen wir fest, dass Unternehmenszusammenschlüsse oft nicht die beabsichtigten signifi-kanten Synergieeffekte haben, die die internationale Wettbewerbsfähigkeit des Unternehmens tatsächlich stärken würden. Stattdessen führen Fusionen eher zu internationalen Wettbewerbsnachteilen. Eine Ursache dafür finden wir im „joint economies of production - Effekt“, den wir hier näher untersuchen. Entsprechend kommen wir zu der Auffassung, dass die Exportorientierung einer Volkswirtschaft statt für eine nachsichtige eher für eine strenge Fusionskontrolle spricht.

Das von uns entwickelte Modell veranschaulicht, wie Fusionen von Unternehmen, bei denen der Synergieeffekt ausbleibt, in einer offenen Volkswirtschaft die Wohlfahrt des Landes reduzieren, und lässt erkennen, dass diese Auswirkungen strengere Fusionsprüfungen nahe legen. Auch empirisch belegen wir unsere These über den Zusammenhang von Exportorientierung und strengerer Fusionspolitik anhand von Paneldaten der Jahre 1990-2001, in denen die US-amerikanischen Fusionsentscheidungen nach den Sektoren des produzierenden Gewerbes geordnet zusammengefasst sind.

1. Introduction

Merger policy has traditionally been the purview of relatively large nations—nations with sizable stakes in securing domestic efficiency (Boner and Krueger, 1991). The trade dimensions of merger policy consequently received scant attention by the economic literature, as trade effects were relatively unimportant for such domestically oriented nations (Richardson, 1999). Two trends appear to be reversing this disconnection between domestic merger policy and international trade orientation. First, a number of relatively small nations (subject to greater trade effects) have introduced or strengthened merger policies over the last two decades (World Investment Report, 2000). For instance, The Netherlands—the epitome of a small open-economy—has recently implemented a relatively sound competition policy. Second, continued internationalization of the world economy suggests that even large nations are increasingly concerned about trade effects. For instance, the former top U.S. antitrust regulator stated "globalization has radically changed the focus of our work, from almost purely domestic less than 10 years ago to a heavy international component today" (Melamed, 2000). Accordingly, a growing dialogue exists on the design and conduct of merger policy in an open economy setting: see Horn and Levinsohn (2001) for a short review of the budding literature referred to as 'open-economy industrial organization'.

Central to the above dialogue is the impact of trade-orientation (specifically, the composite export and import orientations) on the optimal tenor of domestic merger policy. The impact of import-orientation is relatively uncontroversial: imports curb the pricing behavior of domestic firms (Levinsohn, 1993; Harrison, 1994); hence, the more import-oriented an industrial sector, the less anxious need antitrust officials be with regard to domestic merger activity (Landes and Posner, 1981; Abbot, 1985; Ghosal, 2002). From this established basis, we get the common argument that trade and competition policies are substitutes. However, the impact of export-orientation on domestic merger policy is somewhat more controversial, as it raises the possibility of strategic merger policy for international competitive gains. While Acquier and Caves (1979) first formally examined the tradeoffs between domestic consumer welfare and

international profits, recent scholarship within the 'open-economy industrial organization' literature (hereafter, open-economy IO) has considered the impact of export-orientation on optimal domestic merger policy. Strikingly—and despite invoking various oligopolistic scenarios—these scholars (Barros and Cabral, 1994; Levinsohn, 1997; Sorgard, 1997; Head and Ries, 1997; Yano, 2001; Zhang and Chen, 2002) consistently find export-orientation to conditionally favor lenient domestic merger policy under a national-welfare criterion. The main insight being that international competitive gains have a particularly strong weight vis-à-vis domestic consumer-losses when an economy is a big exporter. Such foundations for strategic merger policy—despite involving more nuance than the classic national champion rationale (e.g., Caves, 1982)—run counter to mainstream economic intuition; yet, only the sketchings of a critique have been lodged (see Bliss, 1997; Horn and Levinsohn, 2001).

We have a few concerns with regard to the open-economy IO literature's holding that export-orientation favors lax domestic merger policy. First, we know of no empirical work that tests the relationship between export-orientation and actual merger policy; thus, it is time for this theoretical conformity to be tested. Second, such arguments (e.g., Zhang and Chen, 2002) often posit post-merger synergies despite a sobering literature in finance economics and industrial organization that suggests most mergers do not generate synergies (see Sirower, 1997 and Mueller, 1997 for reviews). For instance, Gugler et al. (2003) find—in the most comprehensive empirical study to date—only thirty percent of mergers to be efficiency-enhancing in the sense that both merging firms and consumers gain post-merger. Instead, market-power and other (e.g., hubris) motives appear to drive most merger activity. The two concerns above—lack of empirical confirmation and prevalence of synergistic-less mergers—raise the possibility that domestic mergers may commonly lead to international competitive losses (not gains).

Accordingly, we question—and empirically test—the prevailing relationship between export-orientation and optimal merger policy, and contend that export-orientation generally favors more stringent (not more lenient) domestic merger policy. In delivering on our contention that export-orientation leads to strict domestic merger

policy, we first develop a model to illustrate that domestic mergers—under conditions of no-synergies and joint-economies of production between domestic and international markets—generate international-competitive-losses: what we term a joint-economies effect. Next, testing for consistent empirical evidence on comprehensive panel data for U.S. merger policy, we find manufacturing sectors characterized by greater export-orientations to experience stricter merger policy.

In sum, we contend that the intuition behind 'the optimality of lenient merger policy in exporting sectors' may be mistaken; or better said, the intuition may be correct but the conditions may not often hold. Instead of commonly resulting in international competitive gains and enhanced national welfare, lenient merger policy may commonly result in international competitive losses and reduced national welfare. This negative welfare effect will be particularly strong when nations are big exporters; hence, suggesting the optimality of strict merger policy in exporting sectors. The remainder of the paper is organized as follows to support the main contention. Section 2 sets up the basic model, and Section 3 examines the effects of a domestic merger on output, price, profit and national welfare. Section 4 presents the empirical analysis and results. Section 5 provides concluding remarks.

2. The Basic Model

We consider a two-country model that is likely to be the simplest structure in which our main problem can be addressed. In country 1 (the 'domestic' market), there are initially two firms, A and B, competing with each other. Of the two firms, firm A also competes with a foreign firm, C, in Country 2 (the 'foreign' market). Let q denote output level. Further, let q^{A1} and q^{A2} respectively denote firm A's outputs in countries 1 and 2, q^{B1} firm B's output in country 1, and q^{C2} firm C's output in country 2.[1] Firms A and B produce differentiated, imperfectly substitutable products, with (inverse) demand functions in the domestic market given by $p^A(q^{A1}, q^{B1})$ and $p^B(q^{A1}, q^{B1})$. For

[1] Note this notation indicates which firm is producing for where (i.e., country 1 or 2).

simplicity, assume that q^{A2} and q^{C2} are homogeneous in the foreign market, with $p_2(q^{A2}+q^{C2})$ being the demand function and $p_2^{'}(\cdot)(\equiv dp/dq)<0$.

Using c_i to denote total costs for firm i (i = A, B, C), the profits of the three firms may be written as:

$$\pi^A(q^{A1},q^{A2},q^{B1},q^{C2}) = p^A(q^{A1},q^{B1})q^{A1} + p_2(q^{A2}+q^{C2})q^{A2} - c_A(q^{A1}+q^{A2}), \quad (1)$$

$$\pi^B(q^{A1},q^{B1}) = p^B(q^{A1},q^{B1})q^{B1} - c_B(q^{B1}), \quad (2)$$

$$\pi^C(q^{A2},q^{C2}) = p_2(q^{A2}+q^{C2})q^{C2} - c_C(q^{C2}). \quad (3)$$

We assume that there are joint economies in firm A's production:[2]

$$\pi^A_{A1A2} \equiv \frac{\partial \pi^A}{\partial q^{A1}\partial q^{A2}} = -c_A^{''}(\cdot) > 0. \quad (4)$$

Suppose that firms choose quantities to maximize their profits and that the exporting firm, firm A, chooses its profit-maximizing quantities for each country separately. Prior to a merger between A and B, therefore, firm A chooses q^{A1} and q^{A2}, firm B chooses q^{B1} and firm C chooses q^{C2} to maximize their respective profits. This would yield a pre-merger Cournot-Nash equilibrium.[3]

The merger between A and B is conceived and modeled as follows. In general, when merging firms produce differentiated products, the merger less likely leads to the

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[2] More generally, the total cost of firm A may be written as $c_A(q^{A1},q^{A2})$. Then condition (4) will become $\frac{\partial^2 c_A}{\partial q^{A1}\partial q^{A2}} < 0$. That is, an increase in q^{A1} will reduce the marginal cost of q^{A2} and vice versa, which suggests joint-economies (or economies of scope) in firm A's production of two outputs. Our results in this paper extend to this more general case.

[3] Our set-up may be considered as a two-country trade model with 'segmented' markets (Brander, 1981; Brander and Krugman, 1983), in that firm A chooses its quantities q^{A1} and q^{A2} for each country. It is noted nevertheless that the fact the markets are segmented does not necessarily imply firm A chooses the profit-maximizing quantities for each country separately since there are cost synergies in the present model.

shutdown of the respective production facilities of the acquiring and target firms. Specifically, firms A and B continue to produce their outputs post-merger, but rather than choose their outputs non-cooperatively, they choose outputs to maximize joint profit. We focus then on the type of merger in which participants continue to produce their respective products, but coordinate their post-merger pricing and output decisions.[4] With this as a backdrop, we go on to explore how a joint-economies effect suggests that lenient merger policy for such mergers might result in international competitive losses and reduced national welfare.

As an aside, additional effects may link lenient merger policy with international competitive losses and reduced national welfare. For instance, Bliss (1997) and Horn and Levinsohn (2001) point out that the recent open-economy IO literature under-appreciates how the number of domestic firms may positively impact export levels. Thus if firms compete a la Cournot, then reducing the number of home competitors in international markets—via lenient merger policy—would result in decreased exports and lower national welfare: a reduced-competitors effect. The basic model we begin presenting here has abstracted from the reduced-competitors effect by assuming that the number of firms in both the domestic and foreign markets remain unchanged following the merger. Nevertheless, our model could be extended to include pre-merger international competition by the acquiring and target firms in order to illustrate the negative impact of fewer home competitors on post-merger exports. While we currently refrain from such an extension so as to concentrate on the joint-economies effect, we would not want it

[4] Some Canadian examples of a no-shutdown merger include: i) In the late 1980s and early 1990s, the Southam newspaper chain (which owned the two major newspapers, The Vancouver Sun and The Province, in Vancouver, British Columbia) bought a large number of community newspapers in the Greater Vancouver area yet continued operating them. ii) In late 1998 Loblaw, a fully integrated food distribution company in Canada, purchased Provigo Inc., the largest retailer/wholesaler in Quebec—the merger of two supermarket chains—but since they operated in somewhat different markets (Provigo was mostly in Quebec where Loblaw was weak) there were virtually no store closures. iii) In 2001, Best Buy Co., Inc. bought Future Shop Ltd while it was planning to enter (having already signed some leases) Canada; nevertheless, it maintained the Future Shop brand when it eventually opened Canadian Best Buy stores. iv) The convergence mergers in broadcasting and telecommunications in the late 1990s and early 2000s would also be examples (e.g., BCE owning the *Globe and Mail* and the CTV television network). Some recent U.S. examples of a no-shutdown merger are disucussed in details in Sibley and Heyer (2003), whereas recent international examples include the completed Air France / KLM merger and the proposed Qantas/Air New Zealand merger.

construed that we figure joint-economies to be the sole driver behind a lenient-merger-policy / international-competitive-losses connection.

Returning to the base model, we aim to compare the post-merger with the pre-merger equilibria in terms of output, price, profit, and national welfare. Unfortunately, it is extremely difficult to directly compare the pre-merger and post-merger price and welfare levels—even in special cases. To overcome this difficulty, we introduce differential techniques. More specifically, as a useful analytical tool, we formulate the industrial structure problem as follows:

$$\underset{q^{A1},q^{A2}}{Max}\ \ \pi^{A}+\theta\pi^{B}\equiv\underset{q^{A1},q^{A2}}{Max}\ \ \pi^{AB}(q^{A1},q^{A2},q^{B1},q^{C2};\theta), \tag{5}$$

$$\underset{q^{B1}}{Max}\ \ \pi^{B}+\theta\pi^{A}\equiv\underset{q^{B1}}{Max}\ \ \pi^{BA}(q^{A1},q^{A2},q^{B1},q^{C2};\theta), \tag{6}$$

$$\underset{q^{C2}}{Max}\ \ \pi^{C}(q^{A2},q^{C2}). \tag{7}$$

Clearly, θ = 0 and 1 respectively correspond to the pre-merger and post-merger cases. Notice that both π^{AB} and π^{BA} are well defined when θ = 0 or 1; furthermore, since π^{AB} and π^{BA} are both linear combinations of two profit functions, any value of θ between 0 and 1 should also represent a conceivable profit function. Given these observations, switching from a pre-merger to a post-merger industrial structure can be calculated as the integral of small changes $d\theta$. Such a small change may be referred to as an 'infinitesimal merger,' and it turns out to be easy to sign the welfare effect of an infinitesimal merger. Consequently, the overall effect of the merger can also be determined because it will have the same sign as the effect of an infinitesimal merger whenever the latter sign does not change in the range of $0 \le \theta \le 1$ — a condition that one can check.[5] For much of the analysis, therefore, we shall treat θ as a continuous variable between 0 and 1.

[5] Note that this is a sufficient but not necessary condition. Farrell and Shapiro (1990) and Oum, Zhang and Zhang (1995) used a similar technique in their analysis of horizontal merger effects and airline hubbing effects, respectively.

Given parameter θ, the Cournot equilibrium is characterized by first-order conditions of the profit-maximization problem (5)-(7), with subscripts denoting partial derivatives:

$$\pi^{AB}_{A1}(q^{A1}, q^{A2}, q^{B1}, q^{C2}; \theta) \equiv \frac{\partial \pi^{AB}}{\partial q^{A1}} = \pi^{A}_{A1} + \theta \pi^{B}_{A1} = 0, \tag{8}$$

$$\pi^{AB}_{A2}(q^{A1}, q^{A2}, q^{B1}, q^{C2}; \theta) = \pi^{A}_{A2} = 0, \tag{9}$$

$$\pi^{BA}_{B1}(q^{A1}, q^{A2}, q^{B1}, q^{C2}; \theta) = \pi^{B}_{B1} + \theta \pi^{A}_{B1} = 0, \tag{10}$$

$$\pi^{C}_{C2}(q^{A2}, q^{C2}) = \pi^{C}_{C2} = 0, \tag{11}$$

and second-order conditions:

$$\pi^{AB}_{A1A1} < 0, \quad \pi^{AB}_{A2A2} < 0, \quad \pi^{AB}_{A1A1}\pi^{AB}_{A2A2} - \pi^{AB}_{A1A2}\pi^{AB}_{A2A1} > 0, \quad \pi^{BA}_{B1B1} < 0, \quad \pi^{C}_{C2C2} < 0. \tag{12}$$

In examining the equilibrium, we impose certain regularity conditions. Since q^{A1} and q^{B1} are (imperfect) substitutes in the domestic market, we have:

$$p^{A}_{B1}(\equiv \frac{\partial p^{A}}{\partial q^{B1}}) < 0, \quad p^{B}_{A1} < 0. \tag{13}$$

Furthermore, following the standard practice in models of quantity competition, we assume that q^{A1} and q^{B1} are 'strategic substitutes' (e.g., Bulow, Geanakoplow and Klemperer, 1985; Tirole, 1988):

$$\pi^{A}_{A1B1} < 0, \quad \pi^{B}_{B1A1} < 0. \tag{14}$$

That is, firm A's (B's) marginal profit (or equivalently, revenue) declines when the output of firm B (A) rises. Since $\pi^{A}_{A1B1} = p^{A}_{B1} + q^{A1} p^{A}_{A1B1}$, we have $\pi^{A}_{A1B1} < 0$ if $p^{A}_{A1B1} \leq 0$.

Therefore, the fact that the outputs of A and C are substitutes provides a sufficient condition for (14). Similarly, in the foreign market, q^{A2} and q^{C2} are strategic substitutes so that:

$$\pi^{A}_{A2C2} < 0, \quad \pi^{C}_{C2A2} < 0 . \tag{15}$$

The comparative static effects of the merger variable θ on the equilibrium outputs, denoted $q^{i}(\theta)$, are derived by totally differentiating the first-order conditions (8)-(11):

$$\begin{bmatrix} \pi^{AB}_{A1A1} & \pi^{AB}_{A1A2} & \pi^{AB}_{A1B1} & 0 \\ \pi^{AB}_{A2A1} & \pi^{AB}_{A2A2} & 0 & \pi^{AB}_{A2C2} \\ \pi^{BA}_{B1A1} & 0 & \pi^{BA}_{B1B1} & 0 \\ 0 & \pi^{C}_{C2A2} & 0 & \pi^{C}_{C2C2} \end{bmatrix} \begin{bmatrix} q^{A1}_{\theta} \\ q^{A2}_{\theta} \\ q^{B1}_{\theta} \\ q^{C2}_{\theta} \end{bmatrix} = \begin{bmatrix} -\pi^{B}_{A1} \\ 0 \\ -\pi^{A}_{B1} \\ 0 \end{bmatrix}, \tag{16}$$

where $i = A1, A2, B1, C2$ and $q^{i}_{\theta} \equiv dq^{i}(\theta)/d\theta$. Notice equations (16) have already been simplified, with $\pi^{AB}_{A1C2} = 0$, $\pi^{AB}_{A2B1} = 0$, $\pi^{BA}_{B1A2} = 0$, $\pi^{BA}_{B1C2} = 0$, $\pi^{C}_{C2A1} = 0$, and $\pi^{C}_{C2B1} = 0$. Since $\pi^{BA}_{B1} = \pi^{B}_{B1} + \theta\pi^{A}_{B1} = [p^{B}(q^{A1}, q^{B1}) + p^{B}_{B1}q^{B1} - c'_{B}(q^{B1})] + \theta[p^{A}_{B1}(q^{A1}, q^{B1})q^{A1}]$, for example, it follows that $\pi^{BA}_{B1A2} = 0$ and $\pi^{BA}_{B1C2} = 0$. For the comparative static analysis of (16) to be useful, we assume that the equilibrium is locally strictly stable — which implies the following: i) the determinant $|\pi_{ij}|$ of the 4×4 matrix, π_{ij}, in (16) is positive; ii) in the absence of the foreign market, the domestic market would still be strictly stable, hence $\pi^{AB}_{A1A1}\pi^{BA}_{B1B1} - \pi^{AB}_{A1B1}\pi^{BA}_{B1A1} > 0$; and iii) in the absence of the domestic market, the foreign market would similarly still be strictly stable, hence $\pi^{AB}_{A2A2}\pi^{C}_{C2C2} - \pi^{AB}_{A2C2}\pi^{C}_{C2A2} > 0$ (e.g., Bulow, Geanakoplow and Klemperer, 1985; Zhang and Zhang, 1996).

3. Effects on Output, Price, Profit and Welfare

To investigate the effect of a merger on national welfare, we first report the following result (the proof is given in Appendix A):

Lemma 1. i) q_θ^{A1} and q_θ^{B1} cannot both be positive; ii) q_θ^{A2} and q_θ^{C2} have the opposite signs; and iii) q_θ^{A1} and q_θ^{A2} have the same sign.

Lemma 1 thus narrows down the sign combination of $(q_\theta^{A1}, q_\theta^{A2}, q_\theta^{B1})$ to only three possibilities: (i) $q_\theta^{A1} < 0$, $q_\theta^{A2} < 0$, $q_\theta^{B1} > 0$; (ii) $q_\theta^{A1} > 0$, $q_\theta^{A2} > 0$, $q_\theta^{B1} < 0$; and (iii) $q_\theta^{A1} < 0$, $q_\theta^{A2} < 0$, $q_\theta^{B1} < 0$. Although Lemma 1 indicates three possibilities, it is eminently plausible – given strategic substitutes and other properties of Cournot-Nash equilibrium – that $q_\theta^{A1} < 0$: an infinitesimal merger between firms A and B will make firm A provide less output in the domestic market. Or put differently, possibility (ii) of Lemma 1 may be ruled out. To see this, solving equations (16) for q_θ^{A1} and q_θ^{A2} yields:

$$q_\theta^{A1} = -\frac{\pi_{A2A2}^{AB}\pi_{C2C2}^{C} - \pi_{A2C2}^{AB}\pi_{C2A2}^{C}}{\pi_{A2A1}^{AB}\pi_{C2C2}^{C}} q_\theta^{A2}, \quad q_\theta^{A2} = \frac{(-\pi_{A1}^{B}\pi_{B1B1}^{BA} + \pi_{B1}^{A}\pi_{A1B1}^{AB})\pi_{A2A1}^{AB}\pi_{C2C2}^{C}}{\left|\pi_{ij}\right|}. \quad (17)$$

Since $\pi_{A2A1}^{AB} = -c_A^{''} > 0$ by (4), $\pi_{C2C2}^{C} < 0$ by (12), and $\pi_{A2A2}^{AB}\pi_{C2C2}^{C} - \pi_{A2C2}^{AB}\pi_{C2A2}^{C} > 0$ and determinant $\left|\pi_{ij}\right| > 0$ by the stability condition, both q_θ^{A1} and q_θ^{A2} must have the opposite sign of term $\pi_{B1}^{A}\pi_{A1B1}^{AB} - \pi_{A1}^{B}\pi_{B1B1}^{BA}$. Furthermore, notice that the following condition has been used in models of quantity competition:

$$\pi_{B1B1}^{BA} < \pi_{A1B1}^{AB}, \quad (18)$$

which is among the weaker known stability conditions for Cournot equilibrium (Dixit, 1986). Since $\pi_{B1}^{A} = p_{B1}^{A}q^{A1} < 0$ and $\pi_{A1}^{B} = p_{A1}^{B}q^{B} < 0$, condition (18) would likely yield:

$$\pi^{A}_{B1}\pi^{AB}_{A1B1} - \pi^{B}_{A1}\pi^{BA}_{B1B1} > 0\,. \qquad (19)$$

Condition (19) holds, for example, when the marginal cost of $c_B(\cdot)$ is linear and when the domestic demand functions, $p^A(q^{A1}, q^{B1})$ and $p^B(q^{A1}, q^{B1})$, are linear and reasonably symmetric.[6] Using Lemma 1 we then obtain the following result:

Lemma 2. Assuming condition (19), an infinitesimal merger between firms A and B gives rise to $q^{A1}_{\theta} < 0$, $q^{A2}_{\theta} < 0$ and $q^{C2}_{\theta} > 0$.

Lemmas 1 and 2 may also be explained more intuitively using Figures 1 and 2. The figures show that an infinitesimal domestic merger will likely reduce firm A's output in both the domestic and foreign market. In Figure 1, the pre-merger Nash equilibrium in the domestic market is given by point E: where the reaction functions for firms A and B – denoted R^A and R^B respectively – intersect and where firm A produces output q^{A1E}. After the merger, the two firms will choose their quantities to maximize joint profits, and the post-merger equilibria will be along the dashed line passing through point J. As shown in the above mathematical derivations, given strategic substitutes and other properties of Cournot-Nash equilibrium, it is eminently plausible that $q^{A1J} < q^{A1E}$. Accordingly, post-merger joint profit maximization likely induces a contraction in firm A's domestic output. Moreover, this contraction raises the marginal cost of providing output in the foreign market due to the existence of joint economies [i.e., condition (4); or more

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6 Note that $\pi^{AB}_{A1B1} = \pi^{A}_{A1B1} + \theta\pi^{B}_{A1B1} = p^{A}_{B1} + p^{A}_{B1A1}q^{A1} + \theta(p^{B}_{A1} + p^{B}_{A1B1}q^{B1})$ and $\pi^{BA}_{B1B1} = \pi^{B}_{B1B1} + \theta\pi^{A}_{B1B1} = 2p^{B}_{B1} + p^{B1}_{B1B1}q^{B} - c^{"}_{B}(q^{B1}) + \theta p^{A}_{B1B1}q^{A1}$. With linear demand functions and $c^{"}_{B} = 0$, we have $\pi^{BA}_{B1B1} = 2p^{B}_{B1} < p^{A}_{B1} + p^{B}_{A1} \le p^{A}_{B1} + \theta p^{B}_{A1} = \pi^{AB}_{A1B1}$, where $p^{B}_{B1} < p^{A}_{B1}$ and $p^{B}_{B1} < p^{B}_{A1}$ by the stability condition and symmetric demands. This will give rise to (19) if the firms have identical costs (and hence $q^{A1} = q^{B1}$). Note, however, that the condition of symmetric demands does not necessarily imply that the two firms have symmetric (i.e., identical) costs. In particular, the cost difference between these two firms should lead firm A to sell more in the domestic market than firm B, i.e., $q^{A1} \ge q^{B1}$. In that case it is shown, as follows, that (19) continues to hold (using the above discussion):
$\pi^{A}_{B1}\pi^{AB}_{A1B1} - \pi^{B}_{A1}\pi^{BA}_{B1B1} = p^{A}_{B1}q^{A1}\pi^{AB}_{A1B1} - p^{B}_{A1}q^{B1}\pi^{BA}_{B1B1} > q^{A1}(p^{A}_{B1}\pi^{AB}_{A1B1} - p^{B}_{A1}\pi^{BA}_{B1B1}) > 0$.

generally, $\frac{\partial^2 c_A}{\partial q^{A1} \partial q^{A2}} < 0$ as indicated in footnote 2] thereby leading to an output contraction in the foreign market as well.

**** Figure 1 Here ****

The foreign market equilibria are described in Figure 2, where E^O denotes the pre-merger equilibrium and E^M the post-merger equilibrium. The left-ward shift of firm A's reaction function illustrates how firm A produces less post-merger, and illustrates how the foreign firm (firm C) produces more post-merger. In terms of the impact on total output in the foreign market, we have:

$$d(q^{A2} + q^{C2}) = dq^{A2} + dq^{C2} = (1 - \frac{\pi^C_{C2A2}}{\pi^C_{C2C2}})dq^{A2}.$$

To sign this term, we introduce the following condition,

$$c_C^{''}(q^{C2}) > p_2^{'}(q^{A2} + q^{C2}). \qquad (20)$$

That is, the foreign firm's residual demand curve, $p_2^{'}(q^{A2} + \cdot)$, intersects its marginal cost curve from above. This condition is met if marginal cost $c_C^{'}(\cdot)$ is constant or increasing, and is used in Farrell and Shapiro (1990). It is among the weaker known stability conditions for Cournot equilibrium (Dixit, 1986).

**** Figure 2 Here ****

Condition (20) implies that in the (q^{A2}, q^{C2})-space the reaction function of firm A is steeper than that of firm C (as shown in Figure 2). In mathematical term, (20) implies that $\pi^C_{C2C2} < \pi^C_{C2A2}$; hence, $d(q^{A2} + q^{C2})$ will have the same sign as dq^{A2}: i.e., the change in the foreign market output will have the same sign as the change in domestic

export. Alternatively – and as shown in Figure 2 – the gain in foreign output will be less than the loss in domestic export. Given that $q_\theta^{A2} < 0$, total output in the foreign market falls, and foreign prices correspondingly rise.

Proposition 1. Assuming condition (19), the post-merger equilibrium consists of:

i) firm A selling less in the domestic market,

ii) firm A selling less, but firm C selling more, in the foreign market,

iii) prices being higher in the foreign market, and

iv) firm C earning greater profit if its post-merger fixed cost does not exceed its pre-merger fixed cost,

relative to the pre-merger equilibrium (i.e., the no merger scenario).

Proof: Parts i)-iii) have been shown in the text. As for part iv), we have:

$\pi_\theta^C = \pi_{A2}^C q_\theta^{A2} + \pi_{C2}^C q_\theta^{C2} > 0$,

because $\pi_{A2}^C = p_2^{'} q^{C2} < 0$, $q_\theta^{A2} < 0$, and $\pi_{C2}^C = 0$ by (11). Thus, if C's post-merger fixed cost does not exceed its pre-merger fixed cost, the merger enhances its profit. *Q.E.D.*

It is noted that under Lemma 2 or Proposition 1, the sign of q_θ^{B1} can be negative or positive. In effect, we can further show that $q_\theta^{B1} < 0$, provided the merger benefits both partners (the proof is given in Appendix A):

Lemma 3. If a merger must benefit both partners, then $q_\theta^{A1} < 0$, $q_\theta^{A2} < 0$, $q_\theta^{B1} < 0$ and $q_\theta^{C2} > 0$.

Given, under Lemma 3, that $q_\theta^{A1} < 0$ and $q_\theta^{B1} < 0$ -- i.e., an infinitesimal merger results in output contraction by the merger partners -- then domestic prices will rise: $p_\theta^A = p_{A1}^A q_\theta^{A1} + p_{B1}^A q_\theta^{B1} > 0$ and $p_\theta^B = p_{A1}^B q_\theta^{A1} + p_{B1}^B q_\theta^{B1} > 0$. As a result, domestic consumers would be worse off post-merger. On the other hand, is there an incentive for

firms A and B to merge? Supposing that the merger decision is made so as to maximize joint profit, we can then obtain:

$$\frac{d(\pi^A + \pi^B)}{d\theta} = (1-\theta)\pi_{A1}^{B} q_{\theta}^{A1} + (1-\theta)\pi_{B1}^{A} q_{\theta}^{B1}. \qquad (21)$$

The right-hand side of equation (21) is positive.[7] The above discussions lead to the following result:

Proposition 2. If a merger must benefit both partners, the post-merger equilibrium consists of:

i) firms A and B selling less in the domestic market,

ii) firm A selling less, but firm C selling more, in the foreign market,

iii) prices being higher in both markets, and

iv) firm C and firms A and B jointly earning greater profits if in both cases the post-merger fixed costs do not exceed the pre-merger fixed costs,

relative to the pre-merger equilibrium (i.e., the no merger scenario).

The condition for Proposition 2 – that both partners must gain from a merger – is particularly reasonable in situations where the two firms produce differentiated products and continue to produce their outputs post-merger. Though in other situations, it might be too stringent. If this constraint were removed, then we would arrive at the results of Proposition 1. Fortunately, as will be seen below, only Proposition 1 is required for our joint-economies of production effect—an effect which suggests that domestic mergers involve international competitive losses, which in turn generates and formalizes our empirical tests.

The basic intuition behind Propositions 1 and 2 is as follows. When two firms produce differentiated products, both may continue to operate out of their respective plants post-merger; hence, the merger allows or facilitates the coordination of pricing or

[7] Note it is zero for $\theta = 1$.

output. Moreover, if one of the merging firms both produces for an international market and has joint economies in the production of domestic and international outputs, then a post-merger domestic-output reduction (or lenient competition policy towards domestic pricing/output coordination) would correspondingly lead to international output contraction. Given the merging firm's international output contraction, the foreign firm would increase output and profit, as their output is a substitute for that of the merging firm. The two domestic firms may still experience a joint profit increase; yet, the profit gain is due mainly to increased market power, as the domestic prices for both (differentiated) products rise. Total output in the foreign market is also likely to fall (i.e., the contraction by the domestic firm dominates the output expansion by the foreign firm); hence, foreign prices rise.

Proposition 2 also illustrates the traditional tension between firms and consumers with regard to mergers. Following the merger, the net-profit of firms in both domestic and foreign markets rises, but consumer surplus falls in both markets. Given this profit/consumer-surplus tension, it is interesting to examine whether total surplus in the home country increases or decreases post-merger. Consequently, we consider a national welfare standard for merger policy; see Bian and McFetridge (2000) for an analysis of the range of potential merger-policy standards. To examine this national-welfare effect, we follow the standard practice in open economy IO of considering a partial equilibrium framework in which domestic consumer demand is derived from a utility function that can be approximated by the form: $u(q^{A1}, q^{B1}) + z$, where z is expenditure on a competitively supplied *numeraire* good, with the price of the *numeraire* being normalized to one, and $\partial u / \partial q^i = p^i$. The consumer surplus in this framework can be written as: $CS^d = u(q^{A1}, q^{B1}) - p^A q^{A1} - p^B q^{B1}$, where subscript *d* stands for 'domestic' market. Total domestic welfare, denoted W^d , can then be written as:

$$W^d = CS^d + \pi^A + \pi^B . \qquad (22)$$

Substitution of (1) and (2) into (22) yields:

$$W^d = u(q^{A1}, q^{B1}) + p_2 q^{A2} - c_A(q^{A1} + q^{A2}) - c_B(q^{B1}). \quad (23)$$

Differentiating (23) with respect to θ and using $\partial u / \partial q^i = p^i$, we obtain:

$$W_\theta^d = (p^A - c_A^{'})q_\theta^{A1} + (p^B - c_B^{'})q_\theta^{B1} + (p_2 + p_2^{'}q^{A2} - c_A^{'})q_\theta^{A2} + p_2^{'}q^{A2}q_\theta^{C2}.$$

Since $p_2 + p_2^{'}q^{A2} - c_A^{'} = 0$ by the first-order condition (9), it follows that:

$$W_\theta^d = (p^A - c_A^{'})q_\theta^{A1} + (p^B - c_B^{'})q_\theta^{B1} + p_2^{'}q^{A2}q_\theta^{C2}. \quad (24)$$

The signs of the mark-up terms in the brackets of (24) are positive by the first-order conditions, whereas the signs of the q_θ^i terms are $q_\theta^{A1} < 0$ and $q_\theta^{C2} > 0$ under Proposition 1, and $q_\theta^{A1} < 0$, $q_\theta^{B1} < 0$ and $q_\theta^{C2} > 0$ under Proposition 2. Accordingly, under Proposition 2, the first two terms on the right-hand side of (24) are negative—reflecting the familiar efficiency loss due to post-merger output contraction in the domestic market. More interestingly, the last term on the right-hand side is also negative—reflecting firm A's revenue decline in the international market owing to the foreign firm's output increase. The sign of W_θ^d is consequently negative, as the decrease in domestic consumer surplus will outweigh the merging firms' profit increase; i.e., home-nation welfare falls following an infinitesimal merger.

It is important to dwell on the last term on the right-hand side in equation (24), as it is negative under both Propositions 1 and 2 and is unique in an open economy setting—the term equals zero in a closed-economy setting. The negative sign of this term broadly captures the international-competitive-losses driven by the joint-economies effect: non-synergistic mergers (motivated by market-power and resulting in no post-merger 'production rationalization') reduce home firms' exports. Further, lower exports reduce

the national welfare merits of the merger, which in turn drives a more stringent merger-review. Consequently, the last term of equation (24) yields a key insight that helps generate and formalize empirical tests. Note further that the economic weight of the third term will likely be greater when industry sectors are more export-oriented (characterized by larger relative values for q^{A2}). In effect, when both the demand functions and the marginal costs are linear, equation (24) can be written as:

$$W_\theta^d = \alpha(\theta) + \beta(\theta) q^{A2}, \qquad (24')$$

with α and β being (negative) constants; in this case, W_θ^d is linear in the export quantity q^{A2}. Hence, the more export-oriented the industrial sector, the more economic weight given to international-competitive-losses. Further, the lower the national-welfare merits of a merger, the more skeptical would be a welfare-maximizing antitrust authority.

The main insight from above can be characterized even more intuitively. Imagine a domestic merger involving a marginally negative national-welfare effect in a closed-economy setting; that same merger in an open-economy setting will be more likely to reduce national welfare because the negative impact on exports is now part of a national-welfare analysis. Further, suppose that a domestic merger marginally improves national welfare – owing for example to partial post-merger savings in fixed costs – in a closed-economy setting; that same merger in an open-economy setting may reduce national welfare because the negative impact on exports is now part of a national-welfare analysis. Accordingly, non-synergistic domestic mergers involving international-competitive-losses compound the welfare concerns of a borderline (where the welfare effect is marginally negative or positive) merger review. As an aside, the above discussion is in direct contrast to Zhang and Chen's (2002) finding that synergistic mergers (motivated by efficiency-gains and resulting in post-merger 'production rationalization') enhance home firms' exports, and thereby enhance the national welfare merits of lenient merger policy.[8]

[8] Also note that Zhang and Chen (2002) consider cases involving homogenous products for merging firms: where mergers naturally lead to production rationalization (which can include the reduction in the number of firms or plants). In contrast, the merging firms produce here differentiated products;

4. Empirical Analysis

The data are panel in nature: covering U.S. merger policy by industrial sector (twenty manufacturing sectors) on an annual basis (the 1990-2001 period). Each panel consists of a two-digit SIC manufacturing sectors; for instance, 'Textile Mill' is one distinct panel consisting of twelve annual observations (1990-2001). While more specific sectoral data (such as three or four digit SIC data) would be desired, U.S. antitrust authorities publicly report data only at the two-digit level in the FTC and DOJ's combined 'Annual Report to Congress on Hart-Scott-Rodino Antitrust Enforcement.'[9] Essentially, beyond constructing a data set on a merger-by-merger basis from the ground up, the above represents the best publicly available data on U.S. merger enforcement. Unfortunately, the state of data on competition policy—both within and across nations—is rather primitive (Horn and Levinsohn, 2001). Nevertheless, an early debate (Long, Schramm & Tollison, 1973; Siegfried, 1975; Preston & Connor, 1992) on the implications of disaggregated data for general antitrust policy finds broad industry aggregation to bias statistical results downward: i.e., makes it more—not less—difficult to detect causal patterns. Further, previous efforts to quantify merger enforcement have focused on price-cost margins (e.g., Warzynski, 2001; Hoekman and Kee, 2003) and concentration ratios (e.g., Clougherty, 2001); accordingly, this empirical effort represents a contribution in itself, as it considers the actual decisions—albeit at a sectoral level—made by antitrust authorities.

Testing our main contention requires two principal variables: a measure of domestic merger policy (the dependent variable), and a measure of export-orientation (the main explanatory variable). Beyond the two principal variables, import-orientation and the number of intra-industry mergers are introduced in order to capture some of the other drivers of manufacturing-sector merger policy, and in order to make better causal

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thus, each firm may continue to operate post-merger out of its respective plant. As a result, each partner would produce less than in the absence of merger, owing to the merger's collusive effect on output.

[9] See www.ftc.gov/bc/hsr/hsrinfopub.htm for the 1997-2001 'Annual Reports to Congress.'

inferences on the main explanatory variable. Accordingly, the basic OLS regression is represented here as follows:

$$\text{Merger-Scrutiny}_{it} = b_0 + b_1*(\text{Export-Orientation})_{it-1} + b_2*(\text{Import-Orientation})_{it-1} + b_3*(\text{Intra-Industry-Mergers})_{it-1} + \varepsilon_{it}$$

where i indexes the twenty manufacturing sectors, and t indexes time. The following paragraphs explain the variable measures in more depth.

The dependent variable must capture the state of domestic antitrust scrutiny for a particular industry sector. We use the number of annual mergers eliciting a 'second-request-investigation' within a two-digit manufacturing sector as indicating the level of antitrust scrutiny for that sector (subsequently referred to as the Merger-Scrutiny variable). Second request investigations denote serious concerns on the part of U.S. antitrust officials, who will consequently require more information from the merging firms, and more time to clear or contest the merger. This level of antitrust scrutiny is a pre-requisite for serious remedial measures: such as divestments and outright prevention. While a proportion of mergers will be cleared by the 'second-request' procedure, such investigations still represent serious antitrust scrutiny: as merging firms will be uncertain of the eventual outcome, required to divulge more information, and need to wait longer for clearance and completion of their intended strategy. Unsurprisingly, many merging parties call off intended mergers when notified of a 'second-request-investigation'. Further, the combined FTC/DOJ 'Annual Report to Congress on Hart-Scott-Rodino Antitrust Enforcement' reveals this measure of U.S. merger policy.[10]

Testing the main contention requires a measure of export-orientation in order to examine whether greater export-weights lead to enhanced or reduced scrutiny for mergers in manufacturing sectors. The U.S. International Trade Commission reports annual data on export levels by two-digit industrial sector; and the U.S. Census Bureau reports data

[10] Unfortunately, no other potential measures of merger policy—such as number of prohibitions or remedial actions—are reported by industrial sector in the Annual Reports.

on total revenue for U.S.-based establishments by two-digit industrial sector. Such measures allow the creation (by simply dividing industrial-sector exports by revenue) of an export-orientation measure (subsequently referred to as the Export-Orientation variable). If the prevailing open-economy IO literature is correct, then export-orientation will negatively affect merger-reviews: i.e., the more a particular industry is characterized as an exporter, the more lenient are U.S. antitrust authorities with regard to merger activity. Yet if our contention is correct, then export-orientation will positively affect merger-scrutiny: i.e., the more a particular industry is characterized as an exporter, the stricter will U.S. antitrust authorities be with regard to merger activity.

As already noted, trade-orientation is composed of not only export-orientation, but also import-orientation; hence, it is exceedingly important to control for the salubrious role imports play regarding domestic merger policy in order to make sound causal inferences on export-orientation. As with exports, the U.S. International Trade Commission reports annual data on import levels by two-digit industrial sector. Taking this measure of imports by industrial sector and dividing by U.S. establishments' total revenue yields a measure of import-orientation (subsequently referred to as the Import-Orientation variable). In line with the standard economic intuition that trade and competition policies are substitutes, we expect import-orientation to negatively impact the level of merger scrutiny.

Mergers that involve acquirers and targets from the same industry sector will clearly merit more attention than mergers composed of pairs from separate industry sectors. Simply put, received wisdom suggests that conglomerate mergers merit the least amount of antitrust concern (though largest amount of stockholder concern). The combined FTC/DOJ Annual Report to Congress reveals the number of merger transactions characterized by merging parties as intra-industry transactions—transactions that are intra-industry in the sense that both the acquirer and target compete in the same three-digit industrial sector. The list of explanatory variables consequently includes the number of three-digit intra-industry mergers occurring within a two-digit manufacturing sector (subsequently referred to as the Intra-Industry-Mergers variable). We expect the

Intra-Industry-Mergers variable to positively affect Merger-Scrutiny; thus, the more intra-industry-mergers in an industrial sector, the more regulators should scrutinize the mergers and acquisitions taking place.

Table 1 presents descriptive statistics on the data for the twenty manufacturing sectors. The top-half reports the means, standard deviations and correlation coefficients for the four main variables. Note that amongst the explanatory variables no correlation coefficients are reported above the '.5' benchmark for eliciting further concern regarding collinearity. The lower half of Table 1 provides more detailed description on the manufacturing sectors that make up the data. Note that the data are 'almost' balanced in that all the panels—with the exception of tobacco—involve a full 12 observations over the 1990-2001 period.

**** Table 1 Here ****

4.1 Econometric Issues

In order to properly estimate the proposed regression model, a few econometric issues should be considered. This section considers four particular issues: 1) serial correlation; 2) panel data properties; 3) reciprocal-causation concerns; and 4) a left-censored dependent variable.

First, time-series data often exhibit serial-correlation – a relationship amongst disturbance terms – which leads to inefficient coefficient estimates and calls for remedial measures. Further, our empirical estimations are likely to experience serial correlation as the regression models are not fully specified: a number of factors that might impact the tenor of merger policy in a particular sector (e.g., market-concentration, entry-barriers and demand-elasticity) are not controlled for due to data limitations. Accordingly, it is no surprise then that the Durbin-Watson statistic for the OLS regression (Regression #1 in Table 2) indicates positive autocorrelation. In line with the contention that the underspecified nature of the regression model drives positive autocorrelation, once

industry fixed-effects are controlled for (Regression #3 in Table 2) positive autocorrelation is no longer indicated; though, 'potential' negative autocorrelation is indicated. Negative autocorrelation is less worrisome as it leads to over-estimation (verse under-estimation as with positive autocorrelation) of the variance for coefficient estimates. Nevertheless, we go on to employ Park's (1967) method (essentially a first-differencing weighted by an estimated first order auto-regressive parameter and then a GLS estimation) for removing first-order autocorrelation from panel data (Regression #4 in Table 2).

Second, panel data often require a choice between fixed-effects and random-effects. Fixed-effect models are called for when the panel-specific effects are unique and unrelated to other panels, while random-effect models are often employed when panel specific effects might be related amongst panels (Hsiao, 1986; Greene, 1990). Further, Wooldridge (2002) notes that first-differencing represents a viable third-option for estimating panel data; particularly when serial correlation (see the first issue above) is a concern. In order to underscore the robustness of our results, we report regression estimations employing all three techniques—fixed-effect, random-effect and first-differencing (the Parks method referred to above)—for estimating panel data. As an aside, F-tests for the incremental contribution of an added explanatory variable support the non-inclusion of period-effects in the regression equations—an observation in line with findings that mergers tend to cluster by industry within merger-waves (Andrade, Mitchell & Stafford, 2001).

Third, reciprocal-causation and simultaneity-bias represent two additional econometric concerns. With reciprocal causation, the principal danger is that the dependent variable (merger-scrutiny) potentially affects the main explanatory variable (export-orientation); hence, the coefficient estimates would lead to spurious causal inferences (Maddala, 1992). Such reciprocal causation would not be so surprising since our theoretical justifications suggest that lax merger policy reduces exports and strict merger policy enhances exports; yet, unreported Granger (1969) tests do not support reciprocal causation concerns. With simultaneity-bias, the principal danger is that any

endogeneity on the part of the explanatory variables that leads to correlation with the regression's error term would violate the assumptions of the classical least-squares method and lead to inconsistent coefficient estimates. Unreported, regression specifications that omit intra-industry-mergers (potentially, contemporaneous with the dependent variable) suggest that the coefficient estimates for Export-Orientation are not affected by such concerns. Despite the evidence that reciprocal-causation and simultaneity-bias are not problematic with our estimations, we lag all the explanatory variables by one period in order to mitigate these potential econometric concerns.[11]

Fourth, the dependent variable—Merger Scrutiny—exhibits left-censoring at zero: i.e., the observed data contains a clustering of zeros and no negative values in terms of the annual number of second-request-investigations for a particular industry sector. Such truncation of the data does not allow expressing any latent negative values for second-request-investigations; thus, calling for a Tobit estimation for censored data (Tobin, 1958).

The regression models reported in the panel data regression results (Table 2) take the above econometric issues into account. Regression #1 reports the standard OLS regression and indicates positive autocorrelation. Regression #2 incorporates a random-effect specification in order to control for any random panel-specific effects. Regression #3 reports a fixed-effect specification – to control for any fixed panel-specific effects – that indicates potential negative autocorrelation. Regression #4 reports the estimation results for the Parks method where the autocorrelation effect is removed. Note that the Park's method reports only 228 observations, as the data for Tobacco manufacturing needed to be dropped since this method requires balanced panels. Regression #5 reports a Tobit-estimation with fixed effects in order to control for the limited nature of the dependent variable and control for any fixed panel-specific effects.

**** Table 2 Here ****

[11] We thank the advice of an anonymous referee for this simple procedure to alleviate any reciprocal-causation and/or simultaneity-bias concerns.

4.2 Results and Interpretation

Table 2 presents the empirical results of the five regression models. All five regression equations indicate decent model-specification: with R-squares ranging from .14 in Regression #2 to 0.84 in Regression #4. More importantly, the five models generate reasonably consistent and significant results for the coefficient estimates: all the common variables exhibit the same sign and statistical significance—except insignificant coefficient estimates for Import-Orientation in Regression's #3 & #5. Due to the general consistency of results across regression models, the following analysis and interpretation discusses the empirical results using a variable-by-variable approach.

The Export-Orientation variable is instrumental in testing the main contention: the more export-oriented an industry, the more vigilant will a national antitrust authority be with regard to domestic merger activity. The coefficient estimate for Export-Orientation is positive, as contended, and significant in each regression equation. Regression #1 yields the most conservative coefficient estimate of 8.59; thus, suggesting that industry's experiencing an increase in their export-orientation by 11.6 percentage points (recall that export-orientation measures exports as a percent of U.S. establishment revenue) would encounter an additional merger investigation per annum. The economic significance of the coefficient estimate can be further illustrated by noting that the average Export-Orientations for Industrial Machinery (0.284) and Printing & Publishing (0.023) suggest that Industrial-Machinery sector would experience an additional 2.25 second-request-investigations per year holding other things constant. Accordingly, the empirical evidence supports our contention that more export-oriented industries experience higher levels of merger-scrutiny.

The Import-Orientation variable is less robust than Export-Orientation: the coefficient estimate is negative as predicted in all five regression equations, but is insignificant in Regression's #3 & #5. Adopting the somewhat conservative coefficient estimate of –2.02 from Regression #1 suggests that industry's experiencing an increase in their import orientation by 49.5 percentage points (where import-orientation measures

imports as a percentage of U.S. establishment revenue) would encounter one less merger investigation per annum. Accordingly, the empirical evidence generally supports the mainstream received-wisdom that imports act as a substitute for stringent domestic merger policy; yet, the economic weight of imports on U.S. merger policy is relatively limited—unsurprising in light of the strong weight given to domestic factors (versus international factors) by U.S. public policy.

The Intra-Industry-Mergers variable is included to make better causal inference on the Export-Orientation variable. Recall that we expected a positive sign for the Intra-Industry-Mergers coefficient estimate, as industries experiencing greater amounts of intra-industry merger activity should merit enhanced merger scrutiny by regulators. As expected, the coefficient estimate for Intra-Industry-Mergers is positive and significant in all five regression-equations. The coefficient estimate in Regression #3 & #5 of 0.014 is the most conservative estimate and suggests that an industry experiencing an additional seventy-one intra-industry-mergers will encounter an additional merger investigation per annum. Accordingly, the empirical evidence generally supports the conventional intuition that intra-industry mergers (as opposed to conglomerate mergers) elicit greater merger scrutiny.

In sum, the empirical results support our contention that the more export-oriented an industrial sector the more antitrust authorities practice strict merger policy. Consequently, there appears to be scant evidence in support of U.S. authorities practicing lenient merger policy in export-oriented industrial sectors. Instead, U.S. antitrust authorities appear to practice strict merger policy when industrial sectors are characterized as exporters.

5. Concluding Remarks

The primary objective of the present paper is to provide a caution about the problems of relaxing competition policy for reasons relating to export activity. Our work was motivated by the conformity in the 'open-economy industrial organization' literature with regard to export-orientation enhancing the optimality of lenient merger policy—a conformity that is confounded by a few observations. First, none of the recent open-economy IO studies proffer empirical evidence. Second, merger synergies support the international-competitive-gains dynamic which rests behind export-orientation favoring lenient merger policy; yet, mergers seldom generate significant synergies. Third, a number of effects (joint-economies, reduced-competitors & reduced-rivalry) may reverse the prevailing relationship between merger policy and international competitiveness.

Accordingly, we contend that export-orientation favors strict (not lenient) domestic merger policy. In making this claim, we focus on how a joint-economies effect might favor export-orientation leading to strict merger policy. In this context, merging firms benefit from the increased collusion made possible by a domestic merger; yet, the reduction in domestic production leads to reduced exports—via joint-economies of production between domestic and foreign output—which in turn leads to reduced national welfare. In order to support this claim, we develop a model illustrative of how non-synergistic domestic mergers in the presence of international sales might reduce national welfare and incur stringent merger-reviews. Further, using a panel data set composed of U.S. merger reviews by manufacturing sector over the 1990-2001 period, we empirically support export-orientation leading to strict (not lenient) merger policy.

One obvious limitation of this work involves our not explicitly testing the joint-economies effect. This omission owes to our inability to elicit the types of mergers notified to US antitrust authorities, and to the potential for other effects to produce the same prediction: lenient merger policy leading to international competitive losses. For instance, one additional effect (a reduced-competitors effect) was broached within the analysis, and entailed lenient merger policy reducing exports (and thereby national

welfare) by reducing the number of home-nation international competitors—where competitors act as a strategic commitment in international markets. Even further, one could posit a reduced-rivalry effect that would entail lenient merger policy reducing exports and national-welfare via the reduced international efficiency of home-nation competitors—an efficiency reduction permitted by a slack domestic competitive environment with less rivalry (Porter, 1990). Accordingly, important extensions to this work are two-fold: first, analyzing and testing the joint-economies effect with more precision; second, analyzing additional drivers -- beyond the joint-economies effect -- behind how domestic mergers (lenient merger policy) might generate international competitive losses (reduced national welfare).

In terms of policy implications, one interesting walk-away from this study regards small open-economies: where trade-orientation—and the composite import and export orientation measures—is high. A number of small open-economies have resisted the adoption of competition policies (e.g., Hong Kong and Singapore) with the stated rationalization that trade policy acts as a substitute for domestic competition policy.[12] This analysis certainly supports the mainstream intuition that imports act as a substitute for stringent merger policy; however, our findings with regard to export-orientation suggest an additional welfare rationale behind adopting merger policy. In short, the more import-oriented an economy the less incentive is there to invest in sound merger policy; yet, the more export-oriented an economy (and small open-economies are big exporters as well as big importers) the more incentive there is to invest in sound merger policy.

Implications on a broader scale involve the ongoing WTO talks where the merits of harmonizing cross-national competition policies have sparked interest. One of the proffered benefits of harmonization is that it will curb export-oriented nations from engaging in beggar-thy-neighbor lenient merger policies. Yet the results here suggest that such concerns may be unwarranted—at least with respect to the US. Instead of engaging in lenient merger policy, nations with export-oriented sectors may actually conduct strict

[12] Singapore has just announced that it would enact a comprehensive pro-competition law in the next few years.

merger policy. The key of course is that the beggar-thy-neighbor dynamic is non-existent in our analysis (i.e., international competitive gains are hard to come by or dubious). One limitation of our study is that we only present data on the US environment; though, the US environment is an important one and involves relatively good data vis-à-vis other nations. Cross-national empirical work is, nevertheless, called for before debate closure and the resultant definitive policy implications—so it remains an open question as to whether export-oriented sectors in other nations are also characterized by relatively strict merger policy. Yet, the burden of proof with regard to the merits of cross-national harmonization of competition policies remains with those who desire to change the status quo.

Figure 1: Equilibria in the Domestic Market

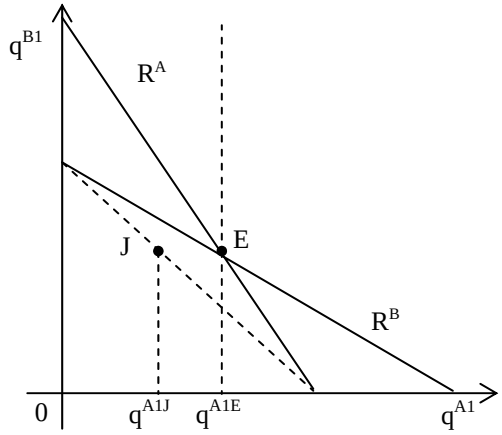

Figure 2: Equilibria in the Foreign Market

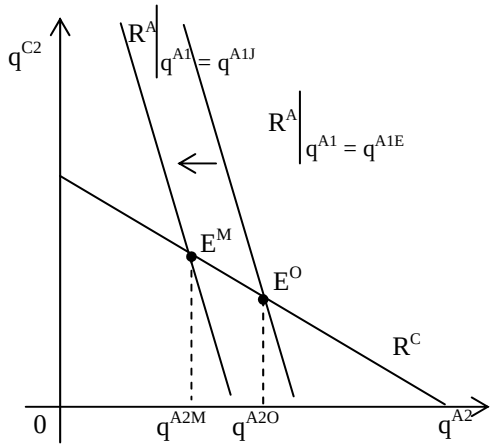

Table 1: Descriptive Statistics

Correlation Coefficients, Means & Standard Deviations for all 237 Observations

	Merger-Scrutiny	*Export-Orientation*	*Import-Orientation*	*Intra-Industry-Mergers*
Mean	2.106	0.123	0.245	25.591
Std. Deviation	2.676	0.079	0.306	31.640
Merger-Scrutiny	1.0			
Export-Orientation	0.273 (0.0001)	1.0		
Import-Orientation	-0.212 (0.0010)	0.422 (0.0001)	1.0	
Intra-Industry-Mergers	0.582 (0.0001)	0.242 (0.0002)	-0.186 (0.0041)	1.0

( ) = p-values

Means & Observation Numbers by Manufacturing Sector

	Merger-Scrutiny	*Export-Orientation*	*Import-Orientation*	*Intra-Industry-Mergers*
Food & Kindred (12)	6.667	0.053	0.045	62.083
Tobacco (9)	0.222	0.130	0.011	1.556
Textile Mill (12)	0.333	0.076	0.093	11.333
Apparel & Other (12)	0.083	0.091	0.579	6.667
Lumber & Wood (12)	0.333	0.072	0.105	11.083
Furniture & Fixtures (12)	0.167	0.058	0.167	6.083
Paper & Allied (12)	1.250	0.081	0.092	17.833
Printing & Publishing (12)	2.750	0.023	0.014	50.250
Chemicals & Allied (12)	7.417	0.155	0.108	63.083
Petroleum & Coal (12)	1.083	0.041	0.080	6.917
Rubber & Misc. Plastic (12)	1.000	0.080	0.114	30.083
Leather (12)	0.000	0.174	1.316	0.167
Stone, Clay & Glass (12)	1.250	0.060	0.109	13.500
Primary Metals (12)	2.250	0.115	0.190	19.917
Fabricated Metals (12)	1.250	0.078	0.083	29.500
Industrial Machinery (12)	4.833	0.284	0.282	54.917
Electronic & Electric (12)	2.833	0.277	0.354	49.500
Transportation (12)	2.917	0.208	0.274	27.750
Instruments & Related (12)	4.333	0.213	0.182	36.083
Misc. Manufacturing (12)	0.667	0.194	0.637	7.500

( ) = Observations by Manufacturing Sector

Table 2: Panel Data Regression Results

Dependent Variable: Merger-Scrutiny (Second-Request-Investigations)

	Regression 1 OLS Estimation	*Regression 2 Random-Effect Estimation*	*Regression3 Fixed-Effect Estimation*	*Regression 4 Parks Estimation*	*Regression 5 Tobit with Fixed-Effect Estimation*
Explanatory Variables					
Constant	0.51*	0.76	5.18***	1.12***	5.02***
	(0.26)	(0.54)	(0.57)	(0.06)	(0.74)
Export-Orientation $_{t-1}$	8.59***	12.02***	13.19**	13.76***	17.88*
	(2.03)	(4.01)	(6.45)	(1.29)	(9.49)
Import-Orientation $_{t-1}$	-2.02***	-2.50**	-1.96	-5.08***	-4.42
	(0.52)	(1.07)	(1.93)	(0.22)	(4.81)
Intra-Industry-Mergers $_{t-1}$	0.04 ***	0.018 ***	0.014***	0.021***	0.014**
	(0.005)	(0.004)	(0.005)	(0.002)	(0.006)
Tobacco			-6.68***		-8.90***
			(0.98)		(1.45)
Textile Mill			-5.82***		-7.45***
			(0.72)		(1.05)
Apparel & Other			-5.27***		-6.97***
			(1.15)		(2.53)
Lumber & Wood			-5.75***		-7.05***
			(0.71)		(1.02)
Furniture & Fixtures			-5.53***		-7.41***
			(0.74)		(1.25)
Paper & Allied			-5.07***		-5.18***
			(0.71)		(0.92)
Printing & Publishing			-3.42***		-3.49***
			(0.67)		(0.86)
Chemicals & Allied			-0.49		-0.81
			(0.88)		(1.17)
Petroleum & Coal			-4.58***		-4.90***
			(0.70)		(0.94)
Rubber & Misc. Plastics			-5.44***		-5.80***
			(0.70)		(0.93)
Leather			-4.90**		-15.63
			(2.22)		(12602)
Stone, Clay & Glass			-4.70***		-4.89***
			(0.70)		(0.94)
Primary Metals			-4.35***		-4.36***
			(0.78)		(1.11)
Fabricated Metals			-5.22***		-5.57***
			(0.69)		(0.90)
Industrial Machinery			-4.31***		-4.81**
			(1.44)		(2.01)
Electronic & Electric			-6.01***		-6.40***
			(1.38)		(2.02)
Transportation			-4.86***		-5.10***
			(1.10)		(1.59)
Instruments & Related			-3.81***		-4.29***
			(1.15)		(1.57)
Misc. Manufacturing			-5.94***		-6.18**
			(1.23)		(2.65)
R-squared	.40	.14	.68	.84	
Log Likelihood					-362.29
Durbin-Watson D	1.45		2.16		
Observations	237	237	237	228	237

( ) = Standard Errors *** = 1% Signif. ** = 5% Signif. * = 10% Signif.

Appendix A

Proof of Lemma 1: i) Rewrite the system (16) in the text as:

$$\pi^{AB}_{A1A1} q^{A1}_{\theta} + \pi^{AB}_{A1A2} q^{A2}_{\theta} + \pi^{AB}_{A1B1} q^{B1}_{\theta} = -\pi^{B}_{A1}, \quad \text{(A1)}$$

$$\pi^{AB}_{A2A1} q^{A1}_{\theta} + \pi^{AB}_{A2A2} q^{A2}_{\theta} + \pi^{AB}_{A2C2} q^{C2}_{\theta} = 0, \quad \text{(A2)}$$

$$\pi^{BA}_{B1A1} q^{A1}_{\theta} + \pi^{BA}_{B1B1} q^{B1}_{\theta} = -\pi^{A}_{B1}, \quad \text{(A3)}$$

$$\pi^{C}_{C2A2} q^{A2}_{\theta} + \pi^{C}_{C2C2} q^{C2}_{\theta} = 0. \quad \text{(A4)}$$

In equation (A3), $\pi^{BA}_{B1B1} < 0$ by the second-order condition (12) and $\pi^{BA}_{B1A1} = \pi^{B}_{B1A1} + \theta\pi^{A}_{B1A1} < 0$ by (14). Thus, if both q^{A1}_{θ} and q^{B1}_{θ} are positive, then the left-hand side of (A3) will be negative. This contradicts with the fact that the right-hand side of (A3) is positive since $\pi^{A}_{B1} = p^{A}_{B1} q^{A1} < 0$.

ii) From (A4), it follows that $q^{C2}_{\theta} = -\pi^{C}_{C2A2} q^{A2}_{\theta} / \pi^{C}_{C2C2}$. Since $\pi^{C}_{C2C2} < 0$ by (12) and $\pi^{C}_{C2A2} < 0$ by (15), q^{A2}_{θ} and q^{C2}_{θ} have the opposite signs.

iii) Substituting $q^{C2}_{\theta} = -\pi^{C}_{C2A2} q^{A2}_{\theta} / \pi^{C}_{C2C2}$ into (A2) and rearranging yields:

$$\pi^{AB}_{A2A1} q^{A1}_{\theta} + (\pi^{AB}_{A2A2} - \frac{\pi^{AB}_{A2C2}\pi^{C}_{C2A2}}{\pi^{C}_{C2C2}}) q^{A2}_{\theta} = 0.$$

Since $\pi^{AB}_{A2A1} = -c^{''}_{A} > 0$ by (4) and $\pi^{AB}_{A2A2}\pi^{C}_{C2C2} - \pi^{AB}_{A2C2}\pi^{C}_{C2A2} > 0$ by the stability condition, q^{A2}_{θ} must have the same sign as q^{A1}_{θ}. *Q.E.D.*

Proof of Lemma 3: Consider the first case: from (2), firm B's equilibrium profit can be written as: $\pi^{B}(\theta) = \pi^{B}(q^{1}(\theta), q^{3}(\theta))$. From the first-order condition (10), it follows that $\pi^{B}_{3} = -\theta\pi^{A}_{3}$ and $\pi^{B}_{\theta} = \pi^{B}_{1} q^{1}_{\theta} - \theta\pi^{A}_{3} q^{3}_{\theta}$. Under case (i) we obtain $\pi^{B}_{\theta} > 0$, since $\pi^{B}_{1} = q^{3} p^{3}_{1} < 0$ and $\pi^{A}_{3} = q^{1} p^{1}_{3} < 0$. In this case, therefore, firm B prefers a merger to no merger. For firm A, its profit is: $\pi^{A}(\theta) = \pi^{A}(q^{1}(\theta), q^{2}(\theta), q^{3}(\theta))$. Using first-order conditions (8)-(9) and rearranging, we obtain: $\pi^{A}_{\theta} = -\theta\pi^{B}_{1} q^{1}_{\theta} + \pi^{A}_{3} q^{3}_{\theta}$. It can be easily seen that $\pi^{A}_{\theta} < 0$ under case (i). Similarly, we can show that $\pi^{A}_{\theta} > 0$ but $\pi^{B}_{\theta} < 0$ under case (ii). Lemma 3 then follows. *Q.E.D.*

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